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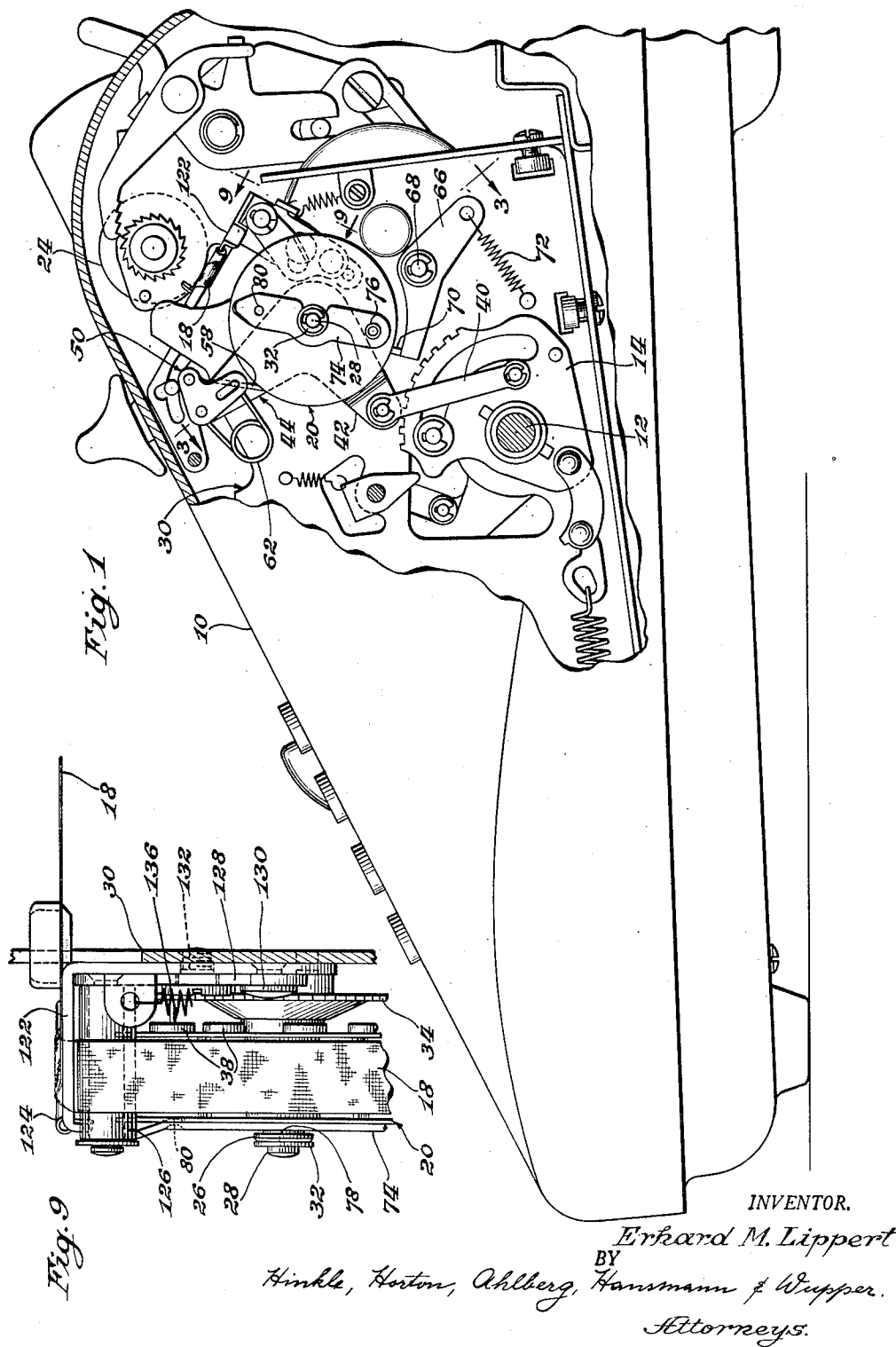
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RIBBON FEEDING MECHANISM

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Fig. 2

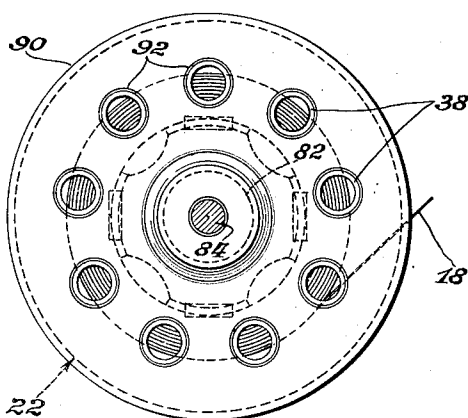
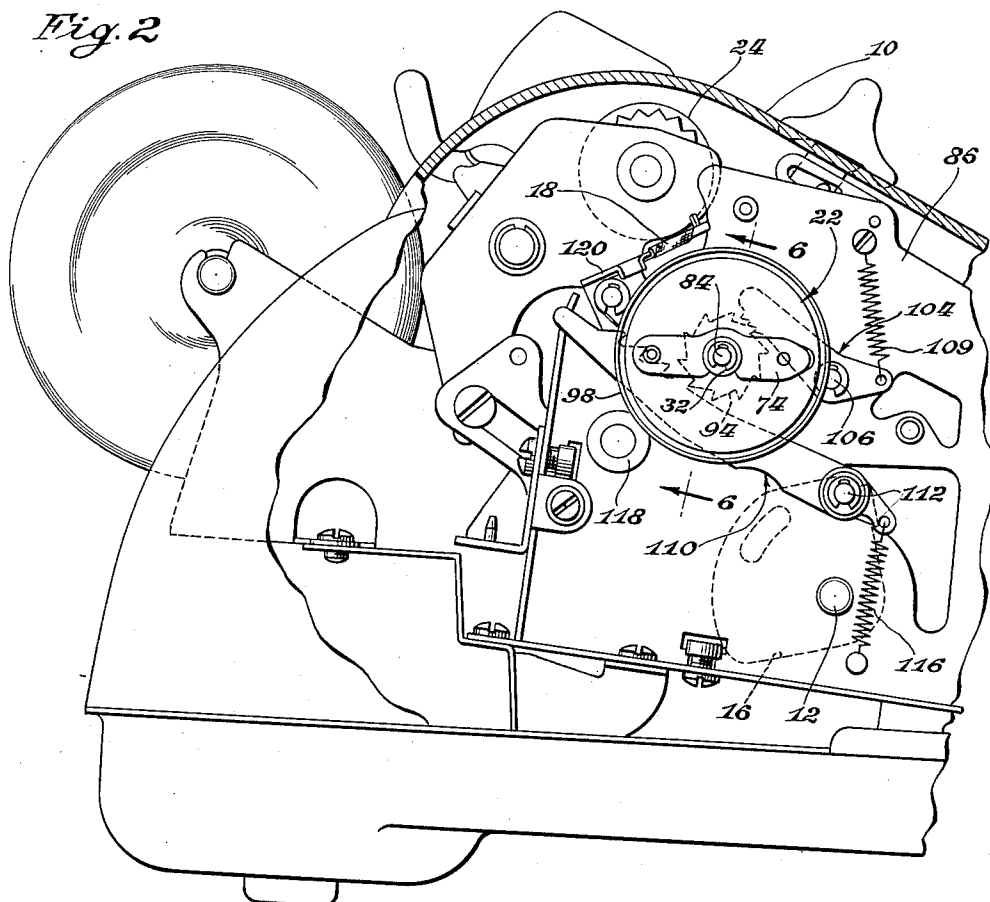


Fig. 8

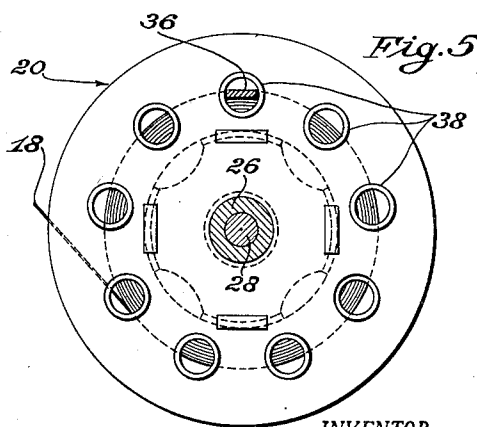


Fig. 5

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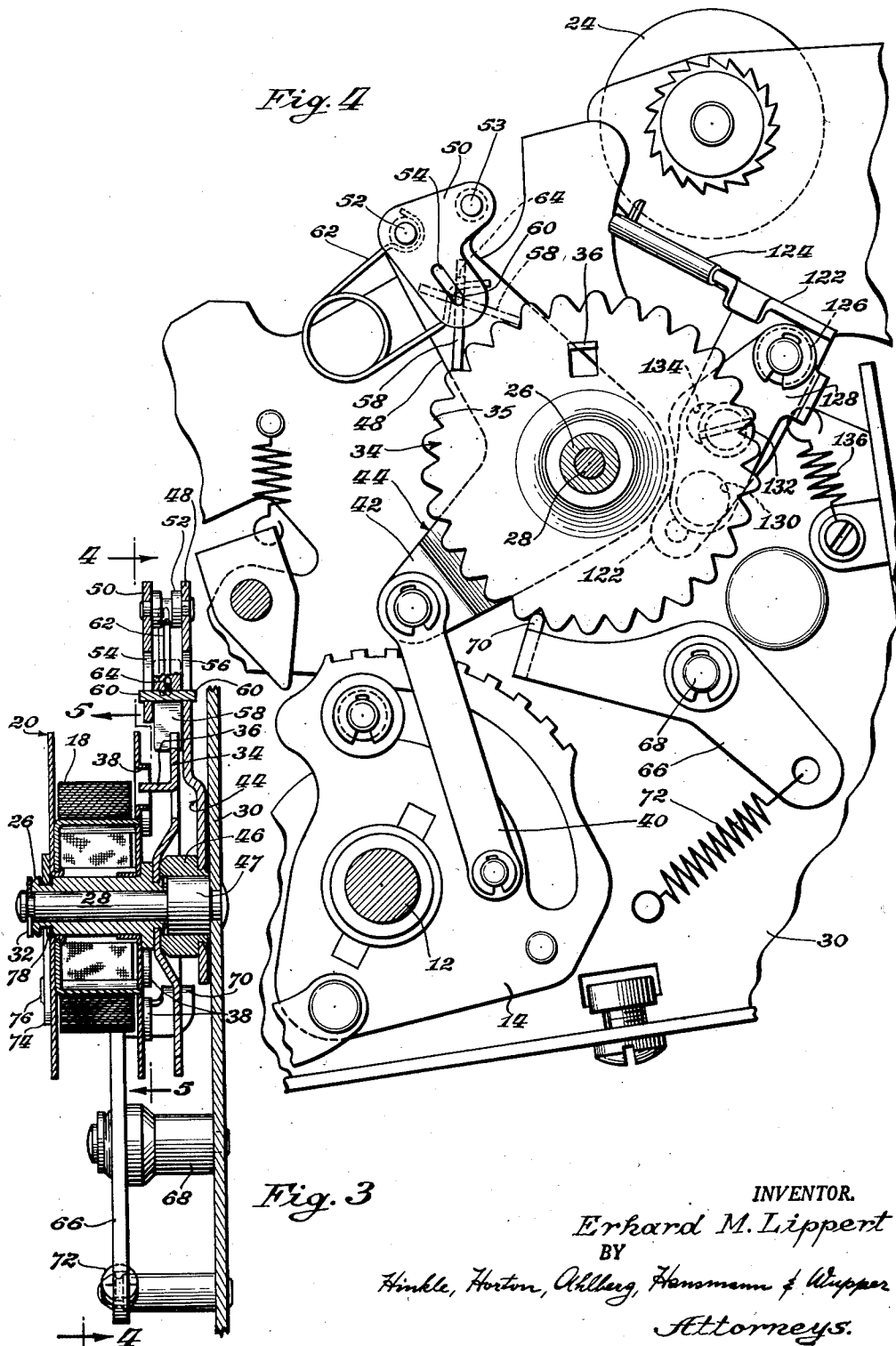
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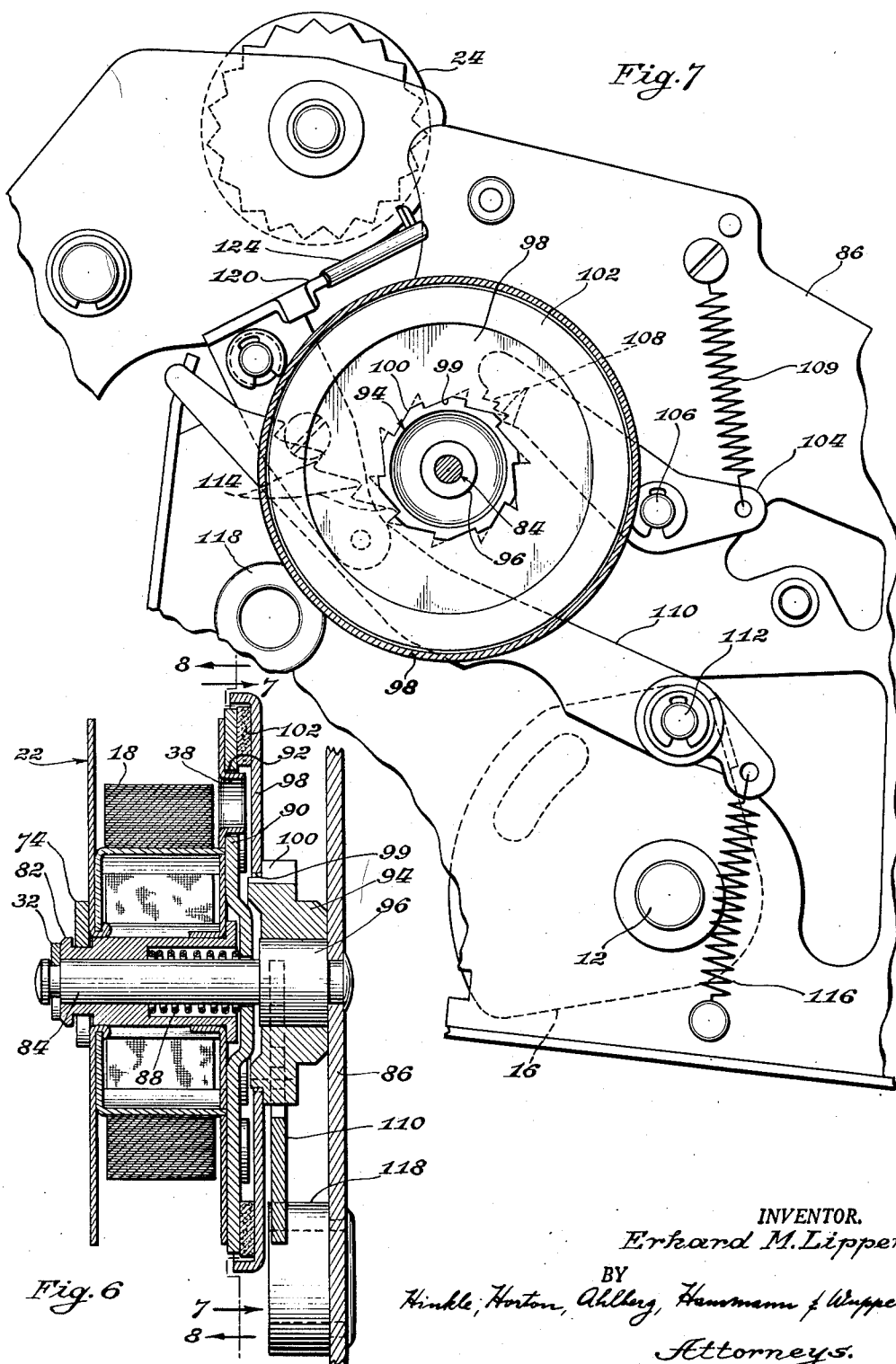
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RIBBON FEEDING MECHANISM

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UNITED STATES PATENT OFFICE

2,665,079

RIBBON FEEDING MECHANISM

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Application January 10, 1950, Serial No. 137,784

1 Claim. (Cl. 242—70)

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My invention relates generally to ribbon feeding and reversing mechanisms for calculating and similar machines, and more particularly to improved drive and detent devices for mechanisms of this character.

The ribbon feeding and reversing mechanism disclosed herein is of the type in which one of the ribbon spools is continuously driven through a frictional driving connection in one direction, and the other spool is driven by a reversible pawl mechanism which is capable of driving the latter spool in either direction, the reversal of the pawl being accomplished whenever the ribbon is completely unwound from the first spool, and the further driving of the second spool is prevented by the tension of the ribbon when it is completely unwound from the first spool, it being understood that the ends of the ribbon are securely attached respectively to the spools.

In ribbon feeding and reversing mechanism of the above mentioned type, some difficulty has been experienced in the frictional drive mechanisms employed, since these become subject to wear in time, resulting in faulty operation of the mechanism. In accordance with the underlying principles of my invention, I employ an improved form of frictional drive mechanism, and in addition supply resilient detents which respectively hold the spools in the positions in which they are advanced by the driving mechanism.

A further object is to provide an improved ribbon feeding and reversing mechanism which is simple in construction, in which the effects of wear over long periods of use are negligible, and which will therefore have a long useful life.

Other objects will appear from the following description, reference being had to the accompanying drawings, in which

Fig. 1 is a right side elevational view of an adding machine incorporating the invention, a portion of the casing being broken away to show the operating parts, and the main operating part being shown in section;

Fig. 2 is a left side elevation of the rearward portion of the adding machine, with a portion of the casing broken away to show the invention;

Fig. 3 is a sectional view, taken on the line 3—3 of Fig. 1, showing the right-hand ribbon spool and its driving mechanism;

Fig. 4 is an enlarged side sectional view, taken on the line 4—4 of Fig. 3;

Fig. 5 is a sectional view of the right-hand ribbon spool, taken on the line 5—5 of Fig. 3;

Fig. 6 is a sectional view of the left-hand rib-

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bon spool and its driving mechanism, taken on the line 6—6 of Fig. 2;

Figs. 7 and 8 are sectional views of the left-hand ribbon spools, taken on the lines 7—7 and 8—8 of Fig. 6; and

Fig. 9 is a fragmentary enlarged sectional view of the right-hand ribbon spool, taken on the line 9—9 of Fig. 1.

The invention is herein shown as forming part of a manually operated adding and listing machine, comprising a casing 10 having the usual numeral and operating keys. The operating handle is connected to the right-hand end of a main shaft 12 which has an operating cam plate 14 secured near its right-hand end, and a somewhat similar cam plate 16 (Fig. 2) secured near its left-hand end, these cam plates forming part of the driving connection between the main shaft and the ribbon feeding and reversing mechanism.

An inking ribbon 18 has its ends secured respectively to a right-hand spool 20 and a left-hand spool 22, and is suitably guided to extend across the face of a platen 24 which is suitably mounted in the frame of the machine, and is driven by a suitable pawl and ratchet driving mechanism.

The right-hand ribbon spool 20 is mounted upon a sleeve 26 mounted for free rotation upon a stud 28 which is riveted to the right-hand frame plate 30 of the machine. The sleeve 26 is held on the stud 28 by a suitable keeper 32 and is staked to a two-way drive ratchet wheel 34. The ratchet wheel 34 has teeth 35 which are symmetrical about a radial plane through the ratchet wheel, the teeth having rounded tips. The ratchet wheel 34 has an outwardly extending lug 36 for engagement in one of a plurality of extruded cylindrical flanges 38 formed in the side wall of the right-hand spool 20. As best shown in Fig. 4, the ratchet wheel 30 is driven from the main shaft 12 through a link 40, the ends of which are respectively pivoted to the cam plate 14 and an offset arm 42 of a bell crank lever 44, the latter being staked to a hub 46 which is pivoted upon the enlarged diameter portion 47 of the stud 28, as best shown in Fig. 3.

The other arm 48 of the bell crank lever 44 has a small plate 50 riveted thereto by spacing studs 52 and 53, and has an elongated slot 54 formed therein in registry with a correspondingly shaped slot 56 formed in the arm 48. A double acting pawl 58 has sidewardly projecting ears 60 which project through the slots 54 and 56 respectively, so as to be guided therein, the pawl 58 being held in engagement with the teeth of the ratchet wheel 34 by a looped wire spring 62, one end of which is hooked about the spacing stud 52 and the other

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end of which is formed to engage in a centrally located slot 64 formed in the upwardly extending portion of the pawl 58.

From the foregoing, it will appear that as the main shaft 12 is oscillated, it will swing the bell crank lever 44 back and forth and that the pawl will therefore drive the ratchet wheel 34, and hence the spool 20, in a direction depending upon the position of the pawl 58 which, as indicated in Fig. 4, may be either in the full line position or in the dotted line position.

A detent lever 66 is pivoted upon a suitable fixed stud 68 and has a sidewardly bent rounded ear portion 70 engageable with the toothed periphery of the ratchet wheel 34, the ear being held in this position by a suitably anchored tension spring 72. The restraining force applied to the ratchet wheel 34 by the detent 66 is sufficient to hold the ratchet wheel against movement as the pawl 58 slides over the teeth of the ratchet wheel 34 in the nondriving direction; but is not sufficient to cause the pawl 58 to change its position to reverse its direction of drive.

It will be observed that the ribbon spool 20 is removably secured to the sleeve 26 by a notched lever 74 pivoted to the spool 20 by an extruded rivet 76 and having its notched portion engaging in a groove 78 formed near the outer end of the sleeve 26, the lever 74 being held in such position by a suitable embossing 80 (Fig. 1) which engages in a suitable hole in the side of the spool 20, it being understood that the lever 74 is sufficiently resilient to cause engagement of the embossed part 80 with such hole in the spool wall.

The left-hand spool 22, which is best shown in Figs. 6 and 7, is mounted upon a sleeve 82 which is freely rotatable upon a stud 84 riveted to the left frame plate 86 of the machine. The sleeve 82 is counterbored to provide a recess for a compression coil spring 88, one end of which presses against the shoulder at the end of the counterbore, and the other end of which bears against a friction disc 90 which is freely rotatable upon the stud 84.

The disc 90 is provided with suitable openings 92 for the reception of the extruded cylindrical flange 38 of the ribbon spool 22 (which is of the same construction as the spool 20). The keeper 32 for holding the sleeve 82 on the stud 84, and the locking lever 74 for holding the spool 22 on the sleeve 82, are similar to the correspondingly numbered parts previously described, and operate in the same manner.

A ratchet wheel 94 is freely mounted for rotation on the enlarged portion 96 of stud 84, and has a second friction plate 98 keyed thereto by virtue of the fact that the plate 98 has notches 99 registrable with the recessed portions of teeth 100, as best shown in Fig. 7. Interposed between the friction plates 90 and 98, is an annular friction disc 102 made of a suitable friction gasket-like material. It will be noted that the friction disc 102 is of relatively large diameter so that it will be capable of transmitting a large torque over long periods of time, without substantial wear, thus making it necessary that the spring 88 need apply but a very small force in holding the friction plate 90 against the friction disc 102.

A detent pawl 104 is suitably pivoted on a stud 106 secured to the left-hand frame plate 86, and has a plurality of closely spaced teeth 108, any one of which may engage with one of the teeth 100 of the ratchet wheel 94 so as to prevent retrograde movement thereof from the maximum position to which it may be moved. The pawl

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104 is held in operative position by a suitable anchored tension spring 109.

The ratchet wheel 94 is also engaged by an actuating pawl 110 pivotally secured to the cam plate 16 by a stud 112 and having a plurality of teeth 114 engageable with the teeth 100 of the ratchet wheel 94, the teeth 114 being resiliently maintained in contact with the teeth of the ratchet wheel 94 by a suitably anchored tension spring 116. As a safety measure, a bushing 118 is secured to the frame plate 86 in position so that if the spring 116 should break or become disconnected, the pawl 110 may slide back and forth freely without causing breakage due to jamming with other parts of the mechanism.

The ends of the ribbon 18 are fixed respectively to the spools 20 and 22, and the ribbon is guided so as to pass below the platen 24 by suitably formed guides 120 (Fig. 7) and 122 (Fig. 4), each of these guides being provided with a suitably curled clip 124 to provide a smooth guiding surface for the ribbon. The ribbon also passes around an idler roller 126 suitably mounted for rotation on an arm 128 pivoted on a stud 130 carried by a downwardly projecting part of the right-hand guide 122, and having its pivotal movement limited by a shouldered screw 132 projecting through an elongated slot 134 formed in the arm 128, the screw 132 being threaded in the right-hand side plate 30, and serving as part of the means to attach the bracket 122 to the frame plate 30. The arm 128 is biased to swing clockwise (Fig. 4) by a suitably anchored tension spring 136. The purpose of the roller 126 is to take up any slack in the ribbon which may occur during certain conditions of operation.

In operation, the bell crank 44 (Fig. 4) and the pawl 110 operate upon each reciprocation of the main shaft 12 to drive their respective ratchet wheels 34 and 94, it being understood, however, that the drive by the pawl 110 is effected through the friction drive provided by the plates 90 and 98 and the friction disc 102. The force applied to the pawl 58 by the spring 62 is sufficient to overcome the friction in the mechanism as well as the friction capable of being transmitted through the friction drive provided by the plates 90 and 98 and friction disc 102.

Thus, assuming that the ribbon has been wound upon the left-hand spool 22 and the ratchet wheel 34 is being driven counterclockwise (Fig. 4), upon the return stroke of the operating handle, that is, upon clockwise rotation (Fig. 4) of the main shaft 12, the ratchet wheel 34 will cause the ribbon to be wound up upon the right-hand spool 20, since the driving mechanism for the right-hand spool applies sufficient driving torque to this spool to overcome the friction applied by the friction drive 90, 98, 102, as well as to overcome other frictional forces tending to retard movement of the ribbon. Under these conditions, the ribbon will be unwound from the left-hand spool and wound upon the right-hand spool, until it has been completely unwound from the left-hand spool. Thereafter further rotation of the ratchet wheel 34 will be prevented by the restraining tension of the ribbon itself. Upon the counterclockwise swinging movement of the bell crank 44, the pawl 58 will be forced upwardly in the slots 54 against the force applied by the spring 62, and will be moved from the position in which it is shown in full lines in Fig. 4 to the position in which it is shown in dotted lines.

Following this reversal of the pawl 58, the

pawl will thereafter tend to drive the ratchet wheel 34 in a clockwise direction (Fig. 4), thus tending to unwind the ribbon from the right-hand ribbon spool 20, during the forward operating stroke. At the same time, the pawl 110, through its drive with the ratchet wheel 94, rotates the left-hand spool 22 counterclockwise (Fig. 7), and the ribbon is wound upon the spool 22.

After the ribbon has been completely unwound from the right-hand spool 20 and wound upon the left-hand spool 22, the pawl 58 continues to drive the ratchet wheel 34, and hence the right-hand spool 20, in a clockwise direction, rewinding the ribbon upon the right-hand spool 20 in a direction opposite to that in which it was previously wound.

After the ribbon has been completely unwound from the left-hand spool 22 and wound upon the right-hand spool 20, the retarding force applied through the tension of the ribbon again holds the ratchet wheel 34 from clockwise rotation by the pawl 58, and the latter is thus forced to return to its full line position. Thereafter it drives the ratchet wheel 34 and right-hand spool 20 counterclockwise, unwinding the ribbon from the spool 20 and permitting it to be rewound upon the spool 22, at a rate determined by the action of the pawl 58 upon the ratchet wheel 34.

During the return operating stroke, it will thus appear, a short length of ribbon is unwound from the right-hand spool 20, and under these conditions the slack takeup roller 126 swings clockwise (Fig. 4) so as to take up this slack. Upon the next following forward operating stroke, the pawl 110, through its drive with the ratchet wheel 94, rotates the left-hand spool 22 counterclockwise (Fig. 7), and this slack in the ribbon is again taken up and the ribbon wound upon the spool 22, since the stroke of the pawl 110 is more than sufficient to take up the length of the ribbon which is unwound by the ratchet wheel 34, the surplusage of movement of the ratchet wheel 94 being dissipated in relative movement of plates 90 and 92 due to their slippage relative to the friction disc 102.

After the ribbon has been completely unwound from the right-hand spool 20, the pawl 58 continues to drive the right-hand spool 20 in a counterclockwise direction, again winding the ribbon upon the right-hand spool 20 in a manner previously described.

The unwinding from the right-hand spool 20 cannot exceed the rate at which the spool 20 is driven by the pawl 58, because of the restraining

force applied by the detent 66. Furthermore, the detent 66 operates to prevent retrograde movement of the ratchet wheel 34 under the influence of the resiliency within the length of the ribbon extending between the two spools, which would otherwise prevent the pawl 58 from advancing past one of the teeth of the ratchet wheel 34, and thus would make it improbable that the pawl 58 would have its position reversed in the manner above described.

While I have shown and described a preferred embodiment of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire, by the following claim, to include within the scope of the invention all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

In a ribbon feeding mechanism, the combination of a stud, a driving wheel including a first friction plate mounted for rotation on the stud, a sleeve rotatable on the stud, said sleeve having an internal counterbore, a second friction plate mounted for rotation on the stud between the sleeve and the first friction plate, a friction disc between the plates, a coil spring located in the counterbore and compressed between the sleeve and the second friction plate to urge the plates into frictional driving relation, a ribbon spool detachably secured to the sleeve and having means forming a positive rotary driving connection with the second friction plate, and means forming shoulders on the opposite ends of the stud to retain the sleeve and the plates on the stud and to transmit the end thrust of the spring to the opposite ends of the stud.

ERHARD M. LIPPERT.

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